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THE U. S. PUBLIC HEALTH SERVICE PROGRAM IN INDUSTRIAL WASTE RESEARCH

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Environmental Health Center
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* THE U. S. PUBLIC HEALTH SERVICE PROGRAM IN INDUSTRIAL WASTE RESEARCH

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The industrial waste research program of the Public Health Service is being carried out mainly under the provisions of Public Law 845, officially cited as the "Water Pollution Control Act" and enacted into law June 30, 1948. It will be the purpose of this paper to give you the highlights of this law as it applies to studies of industrial wastes, the financial provisions for carrying out the responsibilities, and the broad phases of the program now being carried out by the Public Health Service through its grants programs and through the Environmental Health Center at Cincinnati, Ohio.

Industrial waste research is supported and fostered by the Public Health Service in three ways: First, by grants to organizations or individuals for fundamental research through the National Institutes of Health; second, by grants to States or interstate agencies for industrial waste studies in connection with the water pollution control program; and third, by direct engagement in research and field investigations pertaining to industrial waste problems through the Environmental Health Center at Cincinnati.

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Public Law 845

Public Law 845 emphasizes the need for industrial waste research and states that "it shall be the policy of Congress *** to support and aid technical research to devise and perfect methods of treatment of industrial wastes

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vention of pollution. Industrial associations and many industries individually are active in solving their waste problems. There is an increasing realization on the part of industry of its responsibility in this regard. The Water Pollution Control Act did nothing to disturb this basic responsibility. It did, however, extend some assistance to industry in this connection by directing the Public Health Service to support and aid technical research. Another provision of the Act authorizes the Surgeon General, on the request of any State or interstate water pollution control agency, to "conduct investigations and research and make surveys concerning any specific problem *** confronting any *** industrial plant".

The Act permits appointment of one representative from industry as a member of a "Water Pollution Control Advisory Board" established to review Public Health Service programs and policies and to make recommendations. This appointment is now held by Mr. L. A. Danse, Chairman of the General Motors Corporation Industrial Waste Committee.

National Institutes of Health - Research Grants

In addition to aiding industrial waste research through grants under Public Law 845, the Public Health Service also makes grants for fundamental research projects through the National Institutes of Health.

The research grants program of the National Institutes of Health is authorized by the basic "Public Health Service Act" which states in part that "The Surgeon General shall * * * encourage and cooperate with and cooperate with and render assistance to * * * appropriate public institutions, scientific institutions and scientists in the conduct of, and promote the coordination of research, investigations, experiments, demonstrations, and studies relating to the causes, diagnosis, treatment, control, and prevention of * * * diseases * * *

which are not susceptible to known effective methods of treatment, and to provide Federal technical services to State and interstate agencies and to municipalities, in the formulation and execution of their stream pollution abatement programs."

The Act authorizes an appropriation of $1,000,000 per year "to be allotted equitably and be paid to States *** and to interstate agencies for expenditure by them for the conduct of investigations, research, surveys, and studies related to the prevention and control of water pollution caused by industrial wastes."

No appropriations were made for operations under P. L. 845 for the fiscal year ending June 30, 1949. For the current fiscal year, an appropriation of $1,000,000 was made for grants to States and interstate agencies for industrial waste studies. These funds have been allocated as follows: $850,000 to States, $60,000 to interstate agencies, and $90,000 for special studies of industrial wastes having regional or national significance. Grants have been made to States and interstate agencies for the special industrial wastes studies.

For direct operations by the Public Health Service, the initial appropriation under the Water Pollution Control Act for the current fiscal year includes $445,000 for research and field investigations on water pollution problems of which amount a major portion is being used for studies relating to industrial wastes.

Industrial Participation Under P. L. 845

Industry as a group is expected to and does participate in the water pollution control program in many ways. It cooperates with State and other regulatory agencies in preparing comprehensive programs for abatement or pre-

of man, including water purification, sewage treatment, and pollution of lakes and streams." This section further authorizes the Surgeon General to "make grants in aid to universities, hospitals, laboratories, and other public or private institutions, and to individuals for such research projects as are recommended by the National Advisory Health Council."

The Division of Research Grants and Fellowships of the National Institutes of Health was created in late 1945 to administer this program. In 1946, a Sanitation Study Section, later redesignated as the Environmental Health Study Section, was established within the Division, with subsections on Water and Sewage, Milk and Food, Industrial Hygiene and Air Pollution, and Housing. All applications for environmental health research grants are reviewed by the Section and recommendations are made to the National Advisory Health Council, which takes final action on each request.

The Council has established a policy requiring that all projects in this field be of a fundamental or basic character. Therefore, no grants for field surveys, development projects, or experimental pilot plants are approved, since these are classed as non-fundamental research as are the studies needed to develop a process for practical application on a large scale.

Since May 1949, 19 projects in the field of sewage and industrial wastes have been approved. Grants have been authorized for a total of $113,661, covering 18 of the 19 projects. As soon as additional funds become available the grants of $23,004 for the additional project will be authorized.

There is a decided need for additional projects in the field of environmental health, including industrial waste research. A number of the present projects will be terminated at the end of the current fiscal year. It is the desire of the Environmental Health Study Section that research in this field be continued and expanded with a number of new and important projects.

Environmental Health Center, Cincinnati

The Public Health Service activities in connection with the water pollution control program are carried out through the Division of Water Pollution Control, Washington, D. C., ten River Basin Offices in various parts of the United States, and the Environmental Health Center at Cincinnati, Ohio. The Cincinnati Center is responsible for the research and major field investigations undertaken in connection with the program of the Center. Present activities include:

(a) Conduct of field investigations utilizing mobile or field laboratories.

(b) Research studies regarding pollution problems at the Cincinnati laboratories or in the field.

(c) Consulting and training service to States and other agencies on technical problems in the various professional specialties involved in the program.

Industrial waste activities conducted at the Center are carried on through each of the major organizational subdivisions, the Survey and Investigations Branch, the Research and Development Branch, and the Training Section.

Field Investigation Activities

The Industrial Waste Section of the Survey and Investigations Branch is currently engaged in making a systematic review and study of major industrial waste problems. In addition to this general review, detailed attention is being given to specific waste studies, within budgetary limitations, along two lines of endeavor, (1) review of available literature and collection of data pertaining to waste characteristics and methods of treatment, and (2) field investigation of wastes at specific industrial plants.

Studies have already been initiated on: (a) integrated steel mill wastes; with emphasis being placed on by-product coke plant operations, and (b) process wastes from the production of beet sugar. Consideration is being given to a proposed field study of wastes from the manufacture of Kraft pulp in the paper industry.

Cooperative Plant Investigations

The plant studies take the form of cooperative waste investigations with the industry concerned. The investigation is designed to determine the pollution load from specific industrial operations, the characteristics of each major waste, and to determine the effect of operating practices on the waste volume and characteristics. Investigations of corrective methods including treatment are stressed. The investigation concerns not only the final effluent being discharged but also the specific wastes emanating from the various units of the specific plants under study. Correlated studies are also undertaken to determine the capacity of natural waters to assimilate the wastes in question and to determine the extent of interference with water supply or other stream water use.

The investigation of each industrial plant extends through five consecutive days, or longer if necessary, to give sufficiently accurate data for averaging. In order to give a comprehensive picture of the problem, composite samples are collected and analyzed in conformance with knowledge of what is taking place inside the plant. It is necessary that sufficient information be obtained pertaining to the process and plant operation to permit correct interpretation of the analytical and flow data obtained from the investigation.

Special mobile trailer laboratories, equipped for industrial waste studies, are assigned to such investigations. The industry is requested to provide space and utilities for the mobile laboratory, the necessary flow-measuring devices to determine accurately the volume of wastes, and personnel

for collecting and compositing samples for each sampling station at frequent regular intervals. Normally the sampling program can be so arranged that one sampler for each shift can collect all samples and record necessary data. When operations are uniform from hour to hour it is occasionally possible to confine sampling to the day shift.

In certain cases an industry may employ special operational procedures that have been developed within the organization and which might be termed secret processes. Our engineers are required to become familiar with various manufacturing processes in sufficient detail to be able to recognize major waste sources. Any process data or operating information obtained during the survey which is regarded as secret by the industrial plant is held in strictest confidence. Following completion of the field work and analysis of the data, results of the investigations are reviewed with the industry's technical staff prior to preparation of the final report by the Public Health Service.

The main objectives of the cooperative investigations are to contribute additional authentic information regarding process wastes and to obtain further direct information regarding specific industrial waste problems. The information obtained from the field program combined with that obtained from the literature reviews will be used in the preparation of Guides for the various industries. The industrial waste guides prepared by the Public Health Service during the Ohio River Pollution Survey between 1939 and 1942 have been distributed rather widely. Current work will involve bringing these guides up to date, as in the case of the by-product coke industries. In other cases, such as for the beet sugar industry and the manufacture of synthetics, plastics and biotics, it will be necessary to prepare new guides.

Activities already conducted by the Environmental Health Center under Public Law 845 include an investigation during July and August, 1949, of major individual wastes from the by-product coke plant and the blast furnaces of an integrated steel mill ... During October, 1949, by-product coke plant wastes from a plant operated by a large automobile manufacturer were studied.

Cooperative studies of wastes from the new pressure-type blast furnace are scheduled soon with another major steel company. Efficiency of plain sedimentation in the removal of suspended solids from blast furnace flue gas wash water will be determined. The Koppers vapor recirculation and the benzol extraction processes for recovery of phenols from by-product coke wastes are to be included in these studies.

Two studies of beet sugar wastes are now in process, both involving "Straight House" operations. In one case the industry designed, constructed and operated a pilot plant. The Center has rendered assistance through review of plans for the pilot and the furnishing of technical assistance in connection with its operation. Information is being obtained on the settling properties of suspended solids in the waste with various types of chemical treatment. Chlorination and reuse of the process waste water show considerable promise and are being investigated.

Besides the surveys already completed or in progress at operating plants, library research studies have been made for several types of wastes. These include by-product coke plant wastes, blast furnace flue gas wash water, mill scale and oil losses from steel rolling mills, and the combined treatment of industrial wastes and domestic sewage.

Laboratory Research Activities

Analytical Methods

In the Cincinnati laboratories continuous work devoted to the development, improvement and simplification of analytical methods for the examination of industrial wastes or constituents thereof is in progress. Examples of this work included studies of the determination of cadmium, zinc, chromium, cyanide, oxygen consumed, biochemical oxygen demand, and others.

Many of the field activities undertaken point up the need for new or improved analytical methods or the modification of existing methods to cope with conditions encountered in the field. The supporting services of the Center laboratory are constantly at work ironing out difficulties which field studies have brought to light, or in developing methods suitable for field use.

Because progress in the treatment and control of industrial wastes is in no small measure dependent upon the development of suitable analytical control techniques, the Environmental Health Center is making continuous effort to provide better and simpler analytical methods.

Persistence Studies

Endeavor is being made to supplement the general knowledge of biological oxidation obtained by B.O.D. studies with investigations aimed at determining the factors which govern the travel of particular organic chemicals in surface waters. For instance, considerable detailed study has been devoted to the factors involved in the transportation and breakdown of phenolic material between industrial waste sources and water plant intakes. Application of similar studies to other important individual organic pollutants is under way.

Water Quality Studies

Another attack on the problem of water supply pollution is being undertaken through the recovery of organic pollutants actually present in water supplies taken from surface sources. Because of the very minute concentrations involved, the technique here has been to concentrate the organic matter in raw water supplies by the installation of activated carbon filters at strategic water plants. Hundreds of gallons of water are passed through the carbon filters which are then brought back to the Cincinnati laboratory and the organic materials extracted from the carbon. Techniques are being developed for resolving the extracted material into its organic components. Preliminary results show that it is possible to recover significant amounts of organic material from water supplies using this method. The work of separating and identifying the substances recovered is still in its early stages. This method gives promise of being able to show the exact nature of organic materials which reach water supply intakes and to indicate significant sources of pollution and suggest remedies for taste and odor and other water supply problems.

Radioactive Waste Studies

In cooperation with the Atomic Energy Commission, studies are under way with the Los Alamos laboratories on the biological and chemical treatment of wastes containing radioactive materials. As the result of this work and related background studies which are also being undertaken, information is being accumulated on the effect of radioactive materials on biological treatment systems and water purification processes.

Certain materials occurring in radioactive wastes have been observed to greatly affect chemical precipitation and coagulation. While the appearance of these materials in the wastes is incidental to the handling of the radioactive material, nevertheless their presence has important effects on both removal of

the active radioactive materials and on the efficiency and feasibility of coagulation processes. Both the nature of these effects and the measures necessary to control harmful effects noted are being investigated.

In addition, examinations have been started to determine whether the wastes from certain plants handling or processing radioactive materials are entering surface waters in significant amounts.

Toxicity Tests

The Biology Section of the Center is conducting experimental studies directed towards the development and standardization of bio-assay techniques for determining the toxicity of industrial wastes. At present, special emphasis is being placed on the detailed investigation of reaeration rates and dissolved gas equilibria in experimental aquaria under varying conditions. While the current studies are far from complete, it is believed that a promising standardized technique is being developed for making routine toxicity bio-assays of industrial wastes which are troublesome because of the volatility and high oxygen demand of their components.

The Subcommittee on Toxicity, of the Research Committee of the Federation of Sewage Works Associations, is making a review of the literature on the toxicity of industrial and other wastes to aquatic plants and animals, as well as their effects on the natural purification of streams and the operation of sewage treatment plants. The Biology Section at the Cincinnati Center is cooperating with this Committee and will be responsible for the survey and critical analysis of the literature dealing with the toxicity of wastes to fish.

A new section of this same Toxicity Subcommittee has been set up under the Chairmanship of Dr. B. L. Deuderoff of the Center's biological laboratory staff. The function of this section is to select or develop procedures for

the evaluation of the acute toxicity of waste waters and their components to fish. The first meeting of this subcommittee is being held at Cincinnati the latter part of this week.

Conclusion

It is the earnest desire of the Public Health Service to aid the States, interstate agencies, municipalities and industry, in the solution of industrial waste problems. Your cooperation, your suggestions and your criticisms are invited in order that the program may be most effective and useful.